

Spot Safety Project Evaluation

Project Log # 200712083

Spot Safety Project # 08-01-203

**Spot Safety Project Evaluation of the Traffic Signal Installation
At the Intersection of US 74 (Andrew Jackson Highway) and
SR 1305 (Ida Mill Rd) / SR 1125 (Spring Mill Rd)
Scotland County**

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

Jason B. Schronce

Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 08-01-203 – The Intersection of US 74 (Andrew Jackson Hwy) and SR 1125 (Spring Mill Rd) / SR 1305 (Ida Mill Rd) in Scotland County.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of an actuated traffic signal. US 74 is a four lane divided facility at this location with auxiliary left turn lanes in each direction, an exclusive right turn lane on the southeast approach, and a speed limit of 45 mph. SR 1125 / 1305 is a two-lane facility at the subject intersection with concrete medians and a speed limit of 45 mph. The subject location is a crossroads type intersection, which was controlled by dual posted stop signs on SR 1125 / 1305. With the installation of the signal, SR 1125 (Spring Mill Rd) was also provided with a left turn lane and a right turn slip as the concrete channelization median was removed.

The original statement of problem was the developing angle crash pattern as motorists attempted to cross US 74. The intersection met signal warrant 11.

The initial crash analysis was completed from November 30, 1997 to November 30, 2000 with eight (8) reported crashes, all of which were deemed correctable by the countermeasure. The final completion date for the improvement at the subject intersection was on August 27, 2002 with a total cost of \$35,000.00.

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was during the months of August and September of 2002. The before period consisted of reported crashes from July 1, 1997 through July 31, 2002 (5 years and 1 month); and the after period consisted of reported crashes from October 1, 2002 through October 31, 2007 (5 years and 1 month). The ending date for this analysis was determined by the date of available crash data at the time of analysis.

The treatment data consisted of all crashes within 150 feet of the subject intersection. *Please see attached location map and photos for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Frontal Impact Crashes were the target crashes for the applied countermeasure. The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; Angle; and Ran-off Roadway in avoidance of another frontal collision crash type.

<u>Treatment Information</u>			
	Before	After	Percent Reduction (-) Percent Increase (+)
Total crashes	24	17	- 29.17 %
Total Severity Index	5.63	5.35	- 4.97 %
Target Crashes	24	7	- 70.83 %
Target Crash Severity Index	5.63	6.29	11.72 %
Volume	21,600	22,600	4.63 %
<u>Injury Crash Summary - Total</u>			
Fatal injury Crashes	0	0	N/A
Class A injury Crashes	0	0	N/A
Class B injury Crashes	4	2	- 50.00 %
Class C Injury Crashes	11	8	- 27.27 %
Total Injury Crashes	15	10	- 33.33 %

The naive before and after analysis at the treatment location resulted in a 29 percent decrease in Total Crashes, a 71 percent decrease in Target Crashes, and a 5 percent decrease in the Total Severity Index. The before period ADT year was 2000 and the after period ADT year was 2005.

Results and Discussion

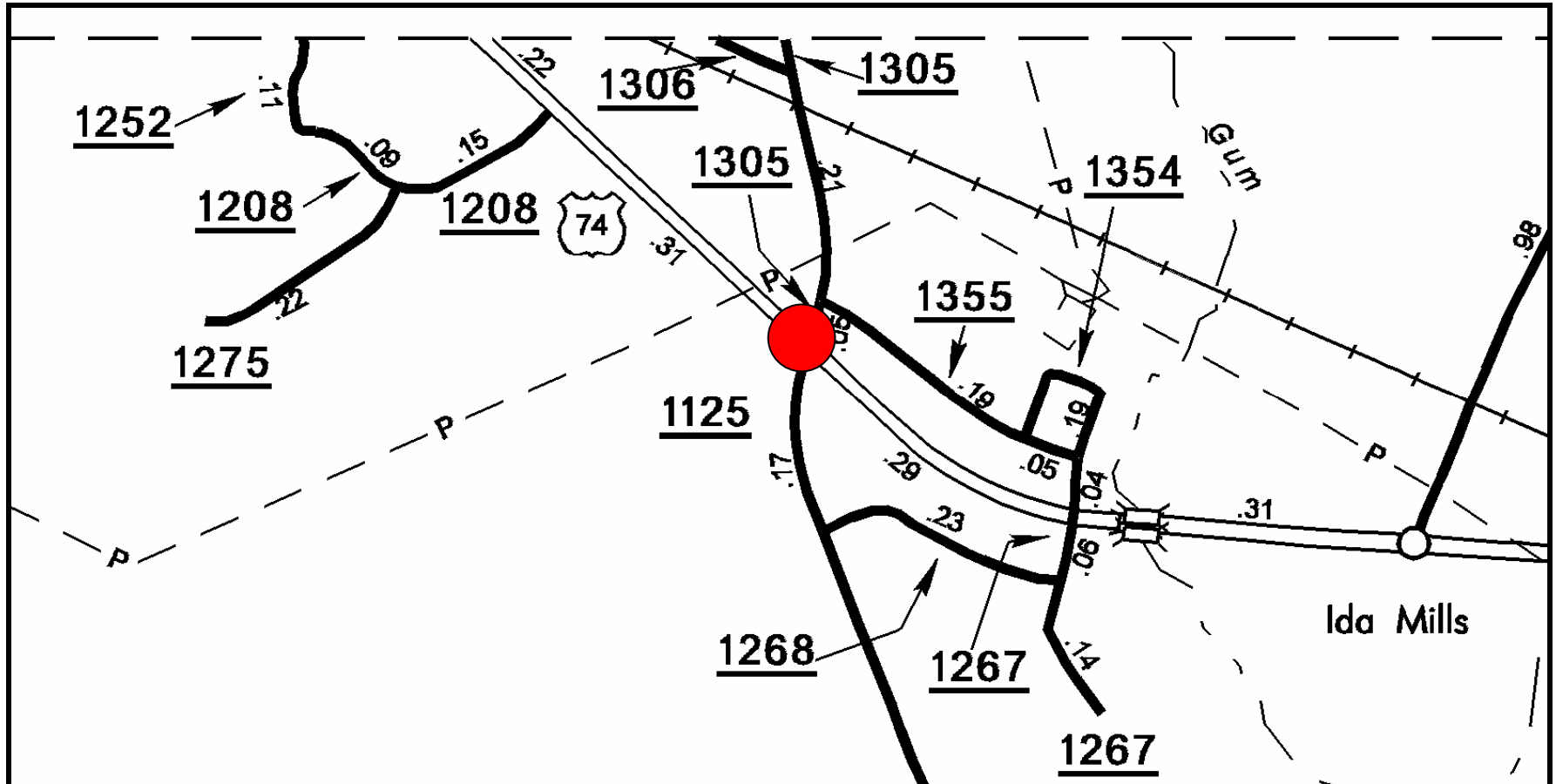
The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 29 percent decrease in Total Crashes and a 71 percent decrease in Target Crashes. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have decreased at the treatment location from the before to the after period.

Referencing the *Collision Diagrams*, a large portion of crashes at the intersection in the before period (21 of 24) were the result of a vehicle attempting to cross US 74 unsuccessfully. After the signal installation, this pattern was significantly reduced to just four (4), which mostly resulted from a vehicle on US 74 running the red light. The only other crash pattern in the after period that developed was six (6) rear-end collisions on US 74, which are typical of a new signal installation.

The calculated benefit to cost ratio for this project is 2.32 considering total crashes. The benefit to cost ratio considering only target crashes is 4.91. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

Please see the attached *Treatment Site Photos*. Photos are provided for all approaches to the treatment intersection. As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of intersection.

Location Map
Scotland County
Evaluation of Spot Safety Project # 08-01-203



Treatment Location: US-74 (Andrew Jackson Hwy) at SR 1125 / 1305 (Spring Mill Road)

SS# 08-01-203 Aerial Map



TREATMENT SITE PHOTOS TAKEN 3/26/2008



Traveling Northeast on SR 1125 (Spring Mill Rd)



Traveling Northeast on SR 1125 (Spring Mill Rd)



Traveling Southwest on SR 1305 (Ida Mill Road)



Traveling South on US 74 (Andrew Jackson Hwy)



Traveling North on US 74 (Andrew Jackson Hwy)



Traveling North on US 74

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 74 at SR 1125 / 1305
COUNTY: Scotland
FILE NO.: SS 08-01-203

BY: JBS
DATE: 4/22/2008
NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - New Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$35,000	10	0.149	\$5,216
	\$0	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0

TOTALS	\$35,000	10	0.149	\$5,216
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ESTIMATED INCREASE IN ANNUAL MAINT. COST =	\$2,200
ESTIMATED INCREASE IN ANNUAL UTILITY COST =	\$900
TOTAL ANNUAL COST=	\$8,316
TOTAL COST OF PROJECT=	\$35,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	5.08	0	0.00	15	2.95	9	1.77	\$60,059
AFTER	5.08	0	0.00	10	1.97	7	1.38	\$40,807

Annual Benefits from Crash Cost Savings \$19,252

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$10,936

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 2.32

TOTAL COST OF PROJECT - \$35,000 COMPREHENSIVE B/C RATIO - 2.32

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 74 at SR 1125 / 1305
COUNTY: Scotland
FILE NO.: SS 08-01-203

BY: JBS
DATE: 4/22/2008
NOTES: Target Crashes - Frontal Impact

DETAILED COST: TYPE IMPROVEMENT - New Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	\$35,000	10	0.149	\$5,216
	\$0	0	0.000	\$0
Right-of-Way	\$0	0	0.000	\$0

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COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

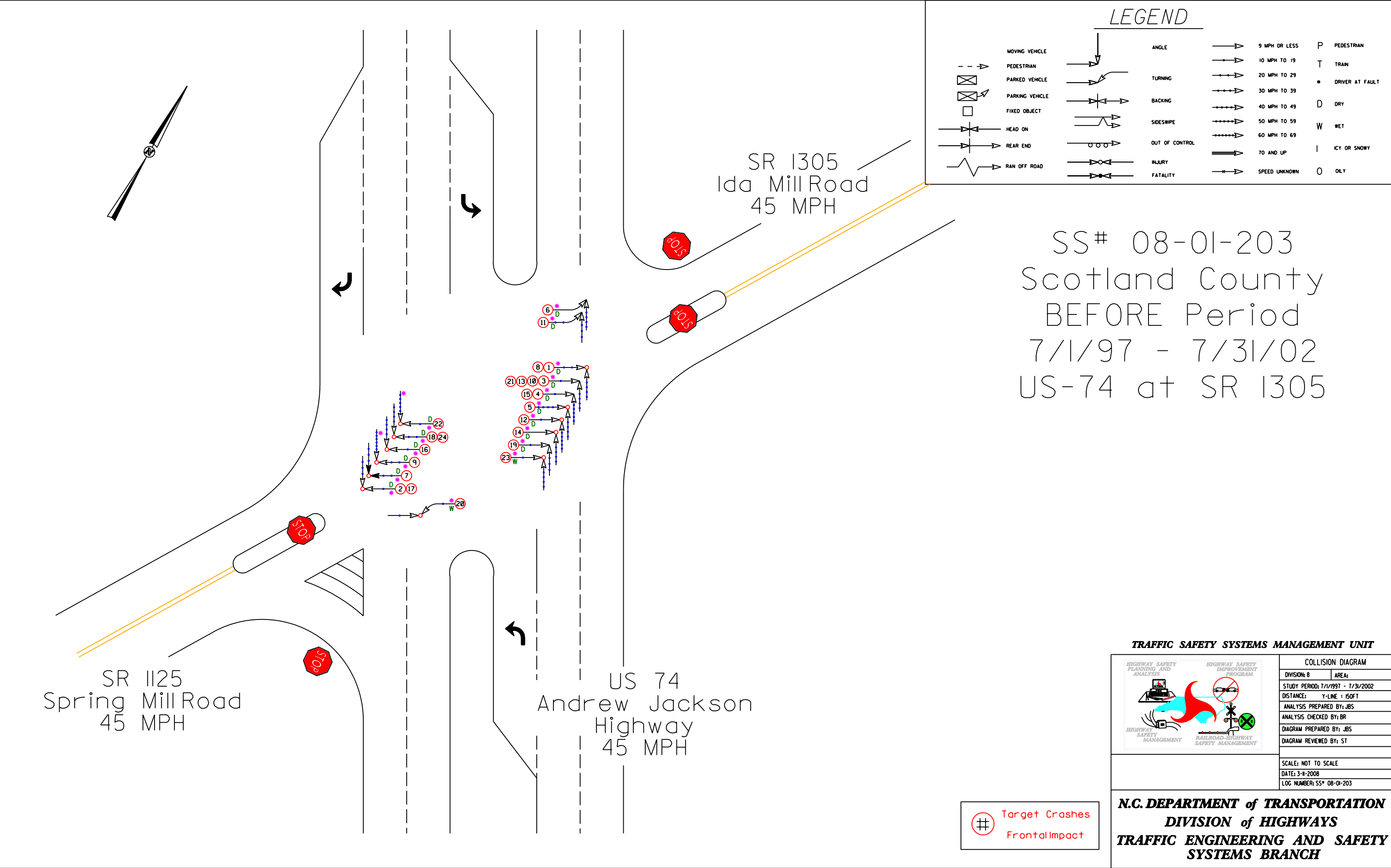
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	5.08	0	0.00	15	2.95	9	1.77	\$60,059
AFTER	5.08	0	0.00	5	0.98	2	0.39	\$19,252

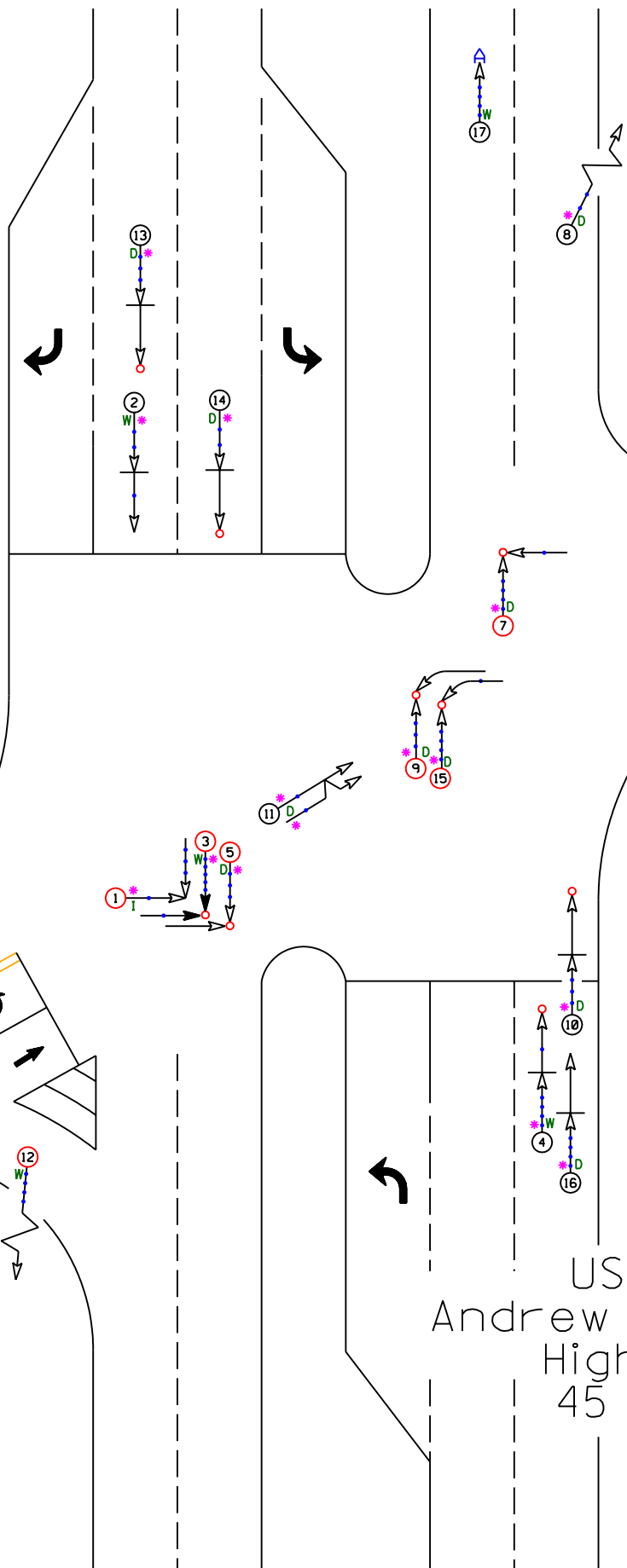
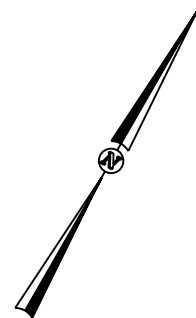
Annual Benefits from Crash Cost Savings \$40,807

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = \$32,491

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 4.91

TOTAL COST OF PROJECT - \$35,000 COMPREHENSIVE B/C RATIO - 4.91





SR 1305
Ida Mill Road
45 MPH

SR 1125
Spring Mill Road
45 MPH

US 74
Andrew Jackson
Highway
45 MPH

LEGEND

	MOVING VEHICLE		ANGLE		9 MPH OR LESS		PEDESTRIAN
	PEDESTRIAN		TURNING		10 MPH TO 19		TRAIN
	PARKED VEHICLE		BACKING		20 MPH TO 29		DRIVER AT FAULT
	PARKING VEHICLE		SIDESWIPE		30 MPH TO 39		DRY
	FIXED OBJECT		OUT OF CONTROL		40 MPH TO 49		WET
	HEAD ON		INJURY		50 MPH TO 59		ICY OR SNOWY
	REAR END		FATALITY		60 MPH TO 69		SPEED UNKNOWN
	RAN OFF ROAD				70 AND UP		ONLY




SS# 08-01-203
Scotland County
AFTER Period
10/1/02 - 10/31/07
US-74 at SR 1305



New Signalized
Intersection

Target Crashes
Frontal Impact

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

<p>HIGHWAY SAFETY PLANNING AND ANALYSIS</p>  <p>HIGHWAY SAFETY MANAGEMENT</p> 	<p>HIGHWAY SAFETY IMPROVEMENT PROGRAM</p>  <p>RAILROAD-HIGHWAY SAFETY MANAGEMENT</p>	<p>COLLISION DIAGRAM</p> <table><tr><td>DIVISION: 8</td><td>AREA:</td></tr><tr><td colspan="2">STUDY PERIOD: 10/1/2002 - 10/31/2007</td></tr><tr><td>DISTANCE:</td><td>Y-LINE = 150FT</td></tr><tr><td colspan="2">ANALYSIS PREPARED BY: JBS</td></tr><tr><td colspan="2">ANALYSIS CHECKED BY: BR</td></tr><tr><td colspan="2">DIAGRAM PREPARED BY: JBS</td></tr><tr><td colspan="2">DIAGRAM REVIEWED BY: ST</td></tr></table> <p>SCALE: NOT TO SCALE</p> <p>DATE: 3-11-2008</p> <p>LOG NUMBER: SS# 08-01-203</p>	DIVISION: 8	AREA:	STUDY PERIOD: 10/1/2002 - 10/31/2007		DISTANCE:	Y-LINE = 150FT	ANALYSIS PREPARED BY: JBS		ANALYSIS CHECKED BY: BR		DIAGRAM PREPARED BY: JBS		DIAGRAM REVIEWED BY: ST	
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N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY
SYSTEMS BRANCH